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GAS VERSUS ELECTRICITY

THE gas companies are at last awakening to the peculiarity of their position, and gas-shareholders are recovering their confidence in the stability of their property. It is interesting to observe how steadily the shares in all the great gas companies have during the last few weeks been rising, and unless any untoward event occurs there is no reason why in a short time they should not recover the position they so singularly lost in August of last year. Looking dispassionately upon the events that have occurred, it is difficult to understand how such a panic and scare could have arisen. Nothing of any sort or kind has been discovered either in the laws of electricity or in their application to electric lighting to account for it. We know no more of the electric light now than we did in 1862, when as great a display was made in our Exhibition of that year as was made in the French Exhibition of last year. There is no doubt, however, that the enterprise of our neighbours on the other side of the Channel in lighting up so brilliantly one of their grand new streets produced a sensation that will not easily be forgotten. Englishmen never like to be beaten. We are accustomed to be startled by inventions from the other side of the Atlantic, but we are not accustomed to be beaten either in commercial enterprise or in inventive skill by our neighbours on this side of the Atlantic. Hence, all of those, whose name is legion, who visited Paris last year came back with exaggerated ideas of the effect of the electric light in the Avenue de l'Opéra, and spread through England a profound opinion of the value of electricity as a means of illumination.

It seems to be forgotten that only three years ago a competitive trial of gas and electricity was made in the clock tower of the Houses of Parliament. Each of these lights were tried for several months, the electric light being a Serrin lamp lit by a Gramme machine; and that, after a very careful examination, gas was successful, was adopted, and is now used by the Office of Works.

Again, it seems to be forgotten that the Elder Brethren of the Trinity House have been experimenting upon this question ever since 1857, and that the results of their experiments have only led to the adoption of the electric light in three of their lighthouses. If the electric light had had the wonderful advantage over gas or oil that its projectors profess for it, surely the governors of such an institution as the Trinity House would have fitted up all the lighthouses upon our coasts with this wonderful light.

The recent experiments, however, have shown both the strength and weakness of the position of the gas companies. Their strength consists in their being in possession of the ground; their weakness consists in their producing only a poor light—and a very poor light—when compared with electricity. But is there any reason why this weakness should continue? Is there any reason why gas should remain such an indifferent light? There is none but that of expense, and expense will not deter people from having a better light if they can only get it. The Phœnix Company has taken the question in hand, and has shown in the Waterloo Road what can be done with gas when the question of expense is not considered. Indeed, it would almost seem, from the experiments that have been made, that the quantity of light to be produced by gas is only a question of the quantity of gas consumed in a given space. There are now burning in the Waterloo Road two brilliant gas lamps, giving a light of 500 candles, and this is greater, in point of fact, than the intensity of the light developed by any one of the electric lights that are now on trial in the thoroughfares of London. There is, however, a defect in gas light which remains to be eradicated, and that is the colour of the light. The one great advantage which the electric light has over gas is that the electric light, owing to its very high temperature, produces rays of every degree of refrangibility, and therefore, as an illuminating power it is equal to that of the sun. But gas light, owing to the lowness of its temperature, is deficient in blue rays, and is therefore not so effective in discriminating colours as the electric light.

A very marked advance towards perfection in this direction in gas lighting has been made in the albo-carbon process, by which the gas burnt is enriched with the vapour of naphthaline—a refuse of gas manufacture. This process is being introduced by Mr. Livesey, and, to judge by the experiments that have been shown, it is very promising indeed. The intensity of the light of a gas burner is improved at least five times, and in some experiments witnessed by the writer the improvement was as much as twenty times.

The tentative trials that are being made with the electric light in London cannot be said to be very successful. That at Billingsgate was certainly a fiasco, that on the Embankment is very brilliant, but we have yet to learn its cost, and there is no doubt whatever that the efficiency of the light is very much less than that usually ascribed to the electric light. The trial on the Holborn Viaduct is not a success. The experiment seems to be conducted by some one who is not experienced in the working of electric circuits, for occasionally all the lamps are found extinguished, on other occasions only a portion of them are burning, and frequently they are very dull. It is quite difficult even at the distance of the Post Office to distinguish the gas from the electric lamp. The same effect is observed on crossing Blackfriars Bridge and looking towards the Houses of Parliament when there is the slightest mist in the air, and it is quite evident that the electric light has no more—if as much—penetrative power than gas.

A most complete and careful inquiry into the working of the electric light has been made by Mr. Louis Schwendler for the East Indian Railway Company, and his results are extremely interesting. He has recommended the introduction of the light into certain railway stations where no gas exists, and the system he proposes to use is the Siemens dynamo-machine and one Serrin lamp, and thereby save that waste which the multiplication of the light unquestionably produces. He proposes to distribute this single light by diffusion on a plan originally suggested by the Duke of Sutherland. His investigation has been conducted in a thoroughly scientific spirit, and when his report is published it will be a very valuable addition to our knowledge of the theory of the electric light. It has

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been shown by the writer that the full effect of the current can only be obtained by one lamp on a short circuit, and that when adding to the lamps by inserting more of them on the same circuit, or on a circuit so that the current is subdivided, the light emitted by each lamp is diminished in the one case by the square, and in the other case by the cube of the number of lamps so inserted. Dr. Siemens maintains also the concentration of the power on one light, but other experimenters are endeavouring to partially multiply the light. For instance, M. Rapieff, in the *Times* office, very successfully distributes six lights about the office, and Ladd and Co., with the Wallace form of machine, also distribute six lights over the Liverpool Street Station. Although there is undoubtedly a loss of power in this distribution of the lamps, there may be an advantage in such distribution in cases like printing offices and railway stations. A successful experiment has been made by the British Electric Company in lighting up some of the stations of the Metropolitan Railway Company, and the India Rubber and Gutta Percha Company have been successful in lighting up the London Bridge station of the London Brighton and South Coast Railway Company. In all these cases we have scarcely emerged from the sphere of experiment. The electric light has not yet been permanently introduced on any large scale. Many are trying it, many are captivated by the brilliancy of the light, and many in their eagerness to keep up with the spirit of the age, are introducing it, as, for instance, the London Stereoscopic Company, and the Messrs. Nichols, the clothiers in Regent Street, where, however, the light does not appear to give very great satisfaction through its fluctuation.

We were led to expect very much from the experiments of Mr. Werdermann, but his attempt to subdivide the light seems to have subsided, for we have heard nothing of it for some time past. Again, we have heard no more of M. Arnaud's discovery, and the accounts that reach us from America of the doings of the Sawyer-Mann light, and of the supposed discoveries of Mr. Edison, are unworthy of attention.

The present state of the electric light question may therefore be said to be a tentative one, and the gas companies are with much enterprise now giving their retort courteous by showing that they are in a position—if people choose to pay for it—to give quite as powerful a light as the electric light; and, let us hope, before long that it will be quite as perfect. There can be no doubt that the use of electricity for the production of light is a very wasteful as well as a costly process, for the energy that is generated in the machine is not all consumed in the lamp, but is proportionately distributed over the whole circuit. It is therefore not utilised only in the place where it is wanted, as in the case of gas. If we are using a certain amount of energy in an electric lamp to light a street, we are wasting as much if not more energy in the street in maintaining the current to produce that light.

There are three points which all electric lights for general purposes should be required to attain. The first is a brilliancy far exceeding that of any known lamp; the second is a durability greater than that which would be required for night operations in England; and the third is absolute steadiness, to enable work to be conducted without affecting the eyes. There is no electric light that has yet been introduced which supplies us with these desiderata. W. H. PREECE

THE "NOVUM ORGANUM"

Bacon's Novum Organum. Edited, with Introduction, Notes, &c., by Thomas Fowler, M.A., Professor of Logic in the University of Oxford. (Clarendon Press, 1878.)

THE writings of Lord Bacon, and especially the "Novum Organum," possess a fourfold interest. They have a direct bearing upon the history of philosophy, literature, logic, and physical science; and whatever estimate we may form of their influence upon each of these branches of knowledge, we think that few will fail to admit that Bacon threw a bridge over that vast and deep gulf which separates the ancient from the modern modes of thought, and directly opened a way to our present philosophy and science. Those who would make him the Founder of a sect, the Inventor of induction, or the Father of experimental philosophy, know nothing of his writings. Many had written against Aristotle before his time, many had advocated the collection of positive facts, and the application of a just induction, but they had offered on their part no system which could replace that of Aristotle. When the Scholastics began to abandon their leader, some took refuge in the meagre philosophies of Ramus, of Telesius, of Aconcio, of Nizolius, of Campanella, and of minor men. But when Bacon gave to the world a vast and definite system, and for the first time pointed out the fallacies of the old methods, and suggested new means of interrogating Nature, the scattered refugees from Scholasticism were glad to unite their forces under his banner.

We must bear in mind at the outset that Prof. Fowler approaches the editorship of the "Novum Organum," from the logical and philosophical, rather than from the scientific side. It is improbable that any one man could combine the very exhaustive knowledge of logic, literature, philosophy, and science, necessary for the complete and thorough editing of the work. The main object on the part of our author has been to show that the "Novum Organum" marks an epoch in the history of logic. At the same time he has by no means neglected the other aspects of the work. He has added copious notes, which from every point of view are admirable. It is only here and there that one detects that some of the notes relating to the scientific matters so largely discussed in the second book, were not written by a man of science. Playfair and Whewell are quoted among the older authorities, while Prof. H. G. S. Smith, Mr. Kitchin, and Prof. Clifton, have lent a willing hand in the elucidation of the more knotty points. The most recent ideas on scientific subjects are introduced: such as the kinetic theory of heat, and the conservation of energy. The liquefaction of oxygen and hydrogen is noticed, although much of the work must have been in type when these discoveries were made. Altogether we have no fault to find with the treatment of the work from a scientific point of view.

There have been wide differences of opinion concerning Bacon's influence on the rise and progress of physical science. While Voltaire and the Encyclopedists on the

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